

REMARKS

I. Introduction.

Claims 14, 16-26, 38 and 39 are currently pending in this Application, of which claims 14 and 21 are independent. Claims 14, 17, and 21 have been amended. Claim 15 has been cancelled without prejudice or disclaimer. Applicant respectfully submits that all pending claims are in condition for allowance.

II. Rejection under 35 U.S.C. §112.

Claim 17 is rejected under 35 U.S.C. 112 as being indefinite for failing to point out and distinctly claim the subject matter which the applicant regards as his invention. Applicant respectfully submits that this rejection is obviated in light of the amendment to claim 17, discussed below.

III. Rejections under 35 U.S.C. §102.

Claims 14, 17-19, 21, 22, 25, 26, 38 and 39 are rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent 6,439,860 to Greer (hereinafter “*Greer*”). Applicant respectfully submits that *Greer* does not disclose or suggest each and every limitation of the rejected claims.

With regards to independent claim 14 as currently amended, *Greer* does not disclose or even suggest a coupling member comprising a bore having a proximal end that is threaded and a distal end that is tapered and not threaded. In particular, the coupling member 6 in *Greer* cited by the Office Action does not have any threads whatsoever (*See e.g.*, Figure 4 of *Greer*).

Likewise, with regards to independent claim 21 as currently amended, *Greer* does not disclose or suggest a rotary degasser comprising a rotor shaft having: “(i) a first end and a second end, the first end being received in and connected to the second coupling member; and (ii) a passage through the rotor shaft, the passage including an opening in the first end of the rotor shaft and an opening in the second end of the rotor shaft.” As is clearly shown in Figure 8 of *Greer*, the impeller drive shaft 12 in *Greer* is solid, without any passages whatsoever. Accordingly, Applicant respectfully submits that *Greer* does not anticipate independent claims 14 or 21, nor any claims dependent thereon.

Additionally, Applicant further submits that *Greer* does not disclose a coupling comprising two coupling members with a passage therebetween for transferring gas, as recited in dependent claims 17 and 22. *Greer* also does not disclose a coupling that comprises one or more apertures configured to receive a tool for disconnecting the shaft from the coupling, as recited in

dependent claims 38 and 39. The only “apertures” in *Greer*’s coupling 6 are “locking pin clearances 6A” through which pins 6B and 6C extend in order to connect the coupler 6 to the shaft 2B, not to receive a tool for disconnecting the shaft 2b from the coupler 6. *See Greer*, col 3, lines 34-54.

IV. Rejections under 35 U.S.C. §103(a).

Claims 14, 17, 19, 21, 22, 26, 38 and 39 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,358,467 to Mordue (“*Mordue’467*”). Claims 14, 17 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 5,154,652 to Ecklesdafer (“*Ecklesdafer*”). Claims 14-17 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 3,258,283 to Winberg et al. (“*Winberg*”). Claims 14-17 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over either of U.S. Patent 2,423,655 to Mars et al. (“*Mars*”) or U.S. Patent 1,377,101 to Sparling (“*Sparling*”). Claims 14, 17, 19, 21, 22 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,451,247 to Mordue et al. (“*Mordue’247*”). Claims 14, 17, 19, 21 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,303,074 to Cooper (“*Cooper’074*”). Claims 15, 16, 18, 20, 23, 24 and 25 are rejected under 35 U.S.C. § 103(a) as being unpatentable over either of *Mordue’247* or *Cooper’074* as applied to claims 14 and 21, in view of U.S. Patent 3,400,923 to Howie et al. (“*Howie*”). Applicant respectfully submits that none of the cited references (alone or in combination) disclose each and every limitation of the rejected claims as currently amended.

As a threshold issue, Applicant notes that each of the above rejections under 35 U.S.C. §103 argue that the reference (or references) discloses a “coupling with proximal and distal ends, where the distal end is tapered and not threaded.” Applicant respectfully submits that, as recited in independent claims 14 and 21, it is the bore through the coupling that has proximal and distal ends, wherein the distal end of the bore is tapered and is not threaded, and wherein the proximal end of the bore is threaded. As discussed below, none of the cited references (alone or in combination) disclose or suggest a bore through a coupling that has a distal end that is tapered and not threaded and a proximal end that is threaded, and therefore cannot render the claimed invention obvious.

Additionally, Applicant respectfully disagrees with the characterizations on page 8 of the Office Action that the bore shape claimed in the present Application has not been shown to have

any unique function over the cited art. As expressly set forth in ¶17 and ¶67 of the Application, the tapered, unthreaded distal end of the bore in the coupling assists in (among other things) centering the shaft and facilitating the easy assembly/disassembly of the shaft from the coupling. Since these advantages are explicitly described in the Application itself, Applicant respectfully submits that an affidavit or declaration reiterating these advantages is unnecessary. *See 37 C.F.R. §1.132* (“When any claim of an application or a patent under reexamination is rejected or objected to, any evidence submitted to traverse the rejection or objection on a basis not otherwise provided for must be by way of an oath or declaration under this section.”) (emphasis added).

Moreover, Applicant respectfully submits that all claim limitations are significant, and must be given weight and effect. *Application of Saether*, 492 F.2d 849 at 852 (C.C.P.A. 1974). If even a single claim limitation is not taught or suggested by a reference, then it cannot be obvious over that reference. *Application of Glass*, 472 F.2d 1388, 1392 (C.C.P.A. 1973). None of the references cited by the Office Action (alone or in combination) disclose or suggest a coupling with a bore having an end that is tapered and not threaded, and therefore the Office Action has not established a *prima facie* case of obviousness.

A. Mordue '467.

The portion of *Mordue '467* cited by the Office Action does not disclose or suggest each and every limitation of independent claims 14 and 21. In particular, the coupling 44 does not disclose or suggest a bore with a distal end that is tapered and not threaded, and a proximal end that is threaded. Moreover, *Mordue '467* expressly teaches away from using threads on the bore of the distal end 56 of the coupling, stating: “[t]he mouth [54] preferably tapers outward at 30° relative to vertical so that it can sealingly engage the inwardly tapered seal 18 of the shaft which is also angled at 30° relative to vertical.” Col. 6, lines 8-11. In *Mordue '467*, the coupling 44 and shaft 10 are connected together using a series of locking members 60 that each includes a stem 66 that extends into cavity 52 and which engage channels 28 in the shaft 10. *See* col. 6, lines 17-50. The use of threads at the bore’s distal end 56 would thus interfere with *Mordue '467*’s stated purpose of sealingly engaging the tapered seal 18 of the shaft, and would be redundant in light of the locking members 60. Accordingly, Applicant respectfully submits that independent claims 14 and 21 are not obvious over *Mordue '467*. The remaining rejected claims (i.e., claims 17, 29, 22, 26, 38, and 39) are each dependent upon claims 14 or 21 and are believed to be allowable for the same reasons set forth above.

B. Ecklesdafer.

The drive shaft coupling cited by the Office Action in *Ecklesdafer* is for “releasably joining two abutting sections of a drive shaft such as used to drive an inboard power boat.” Abstract. The Office Action contends that the coupling 3 in *Ecklesdafer* includes a bore with a distal end that is tapered and not threaded and that could be employed for transferring gas (Office Action, page 4). Applicant respectfully disagrees. The coupling in *Ecklesdafer* is formed from “two identical halves (3, 4)” that hold an “internally positioned sleeve (12)” and that form “a rigid joint between the main shaft (1) and the tail shaft (2).” Col. 2, lines 30-34. The coupling 3 uses mounting bolts 5 to interface with grooves (9, 10) in the shafts to “form a lock to keep the main shaft (1) and the tail shaft (2) contained within the coupling.” Col. 2, lines 57-60. The two halves of the coupling (3, 4) are held together with mounting screws (5, 11). It is unclear, and the Office Action does not explain, how gas could be transferred through the coupling without leaking through the multiple screw holes in the coupling or through the joints between the two halves of the coupling. *See Fig 2 and 3A.*

Additionally, *Ecklesdafer* does not disclose or suggest that any portion of the bore through the coupling is “tapered” as recited in independent claim 14. To the contrary, the figures and specification of *Ecklesdafer* suggest that shafts 1 and 2 (as well as the sleeve 12 through which shafts 1 and 2 are disposed) are the same diameter through the entire length of the coupling. *See e.g., Figs. 3A-5.* Since the stated purpose of the coupling is to “drive a propeller shaft while maintaining correct relative position both radially and axially between the drive shaft and propeller shaft” (col. 1, lines 11-13, emphasis added) both shafts (1, 2) must be of the same diameter to have the same radial position and to turn at the same speed. Additionally, no portion of *Ecklesdafer* discloses or even suggests that the coupling 3 includes an end that is threaded as required by claim 14. As such, Applicant respectfully submits that independent claim 14 is not obvious over *Ecklesdafer*. The remaining rejected claims (i.e., claims 17 and 19) are each dependent upon claim 14 and are believed to be allowable for the same reasons set forth above.

C. Winberg.

The double box collar C in *Winberg* cited by the Office Action is for interconnecting the last section of a drilling shaft (length L) with a drill bit 78, as shown in Figure 8. The double box collar C in *Winberg* is not, however, a coupling member that comprises a bore with proximal and distal openings, where the distal end is tapered and is not threaded, and wherein the proximal end is threaded. To the contrary, double box collar C is formed from two separate “boxes” (18 and

74) connected by an apparently solid intervening structure (not labeled). *See Figure 8. Winberg* does not disclose or suggest that this intervening structure includes any sort of bore, nor would a bore serve any apparent purpose in the double box collar C, particularly since drill bit DB is also depicted as being completely solid. Moreover, a bore through the intervening structure of the double box collar C in *Winberg* would thus only serve to weaken the overall structure of the collar at the portion of the shaft experiencing the greatest force (i.e., near the drill bit DB), a modification expressly discouraged by *Winberg* since the drilling shaft must be able to withstand “high torque” drilling operations. *See* col. 1, lines 36-47. As such, Applicant respectfully submits that *Winberg* does not disclose or suggest a coupling member comprising a bore, and actively teaches away from such a modification. Applicant therefore submits that independent claim 14 is not obvious over *Ecklesdafer*. The remaining rejected claims (i.e., claims 17 and 19) are each dependent upon claim 14 and are believed to be allowable for the same reasons set forth above.

D. Mars and Sparling.

Neither *Mars* nor *Sparling*, alone or in combination, disclose or suggest each and every limitation of independent claim 14. *Mars* relates to pipe couplings (e.g., for pipes that carry “water, oil, air, or steam” (col. 1, line 12)). As disclosed in *Mars*, “[o]ne of the important features of this invention” is the “gasket element 19,” which is preferably made from “lead” or “lead alloy.” Col. 1, lines 36-55. In *Mars*, the compression member 30 cited by the Office Action is used to compress the lead gasket 19 “against the ends of the pipes inserted into the joint, sealing these pipe ends against the surface of the pipe by the bonding action of the lead material of the gasket.” Col. 3, line 65 – col. 4, line 7. Thus, the operation of the coupling in *Mars* is inextricably tied to the use of a lead gasket, a material that is unlikely to be able to survive the high temperatures experienced by a coupling for use in transferring gas in a molten metal device, as recited in independent claim 14. Additionally, the coupling member 30 cited by the Office Action does not disclose a bore with a distal end that is tapered and not threaded, and a proximal end that is threaded, as recited in claim 14.

Likewise, the device in *Sparling* fails to disclose or suggest the limitations of independent claim 14. In *Sparling*, two shaft members 14 are inserted into a longitudinally-slotted clamping sleeve 13, over which two separate collars 15 are placed and clamped to the sleeve 13 using a portable vise. Col. 1, line 33 – col. 2, line 61. *Sparling* does not disclose or suggest that either

the clamping sleeve 13 or the collars 15 include a bore with a distal end that is tapered and not threaded, and a proximal end that is threaded. Additionally, it is unclear how the clamping sleeve 13 could be used to transfer gas without gas leaking through the longitudinal slots.

Applicant therefore submits that independent claim 14 is not obvious over either *Mars* or *Sparling* (alone or in combination). The remaining rejected claims (i.e., claims 17 and 19) are each dependent upon claim 14 and are believed to be allowable for the same reasons set forth above.

E. Mordue '247.

The portion of *Mordue '247*, cited by the Office Action does not disclose or suggest each and every limitation of independent claims 14 and 21. With regards to claim 14, the coupling 21 does not include a bore with a distal end that is tapered and not threaded, and a proximal end that is threaded. While the outer wall of the coupling 21 is tapered, no portion of *Mordue '271* discloses or suggests that the coupling 21 has a bore that is tapered. Furthermore, no portion of the coupling 21 has any threads whatsoever.

Additionally, with regards to claim 21, Applicant notes the coupling 21 cited by the Office Action in Figures 1 and 2 is part of a molten metal transfer pump 1, not a degasser. Col. 4, lines 26-27. The shaft 19 depicted in Figures 1 and 2 is solid, and as such is not a rotor shaft that includes a passage through the rotor shaft as required by independent claim 21. Only one small portion of *Mordue '247* alludes to the modification of the shaft for degassing: “the degassing embodiment would most likely include a bore through the rod – or a sufficient gap between the sheath and the rod – to facilitate introduction of a reaction gas or other suitable agent.” Col. 6, lines 64-67. *Mordue '247* does not describe how the molten metal pump 1 would be modified to utilize such a shaft for degassing (nor how gas would be provided through the rod), much less explain how the rod with the bore through it would be coupled to the motor 17 using coupling 21 without allowing gas to leak from the coupling. Applicant therefore submits that *Mordue '247* cannot reasonably be said to disclose a rotary degasser that includes a rotor shaft with a passage through the shaft as recited by independent claim 21.

Applicant therefore submits that independent claims 14 and 21 are not obvious over *Mordue '247*. The remaining rejected claims (i.e., claims 17, 19, 22, and 26) are each dependent upon either claim 14 or 21 and are believed to be allowable for the same reasons set forth above.

F. Cooper '074.

The coupling 38 in *Cooper '074* does not include a bore that is tapered at the distal end as recited in claims 14 and 21, rather it is the outer wall of the coupling 38 that is tapered.

Additionally, with regards to independent claim 14, the coupling 38 in *Cooper '074* does not include a bore with a distal end that is tapered and not threaded, and a proximal end that is threaded. To the contrary, *Cooper '074* states: “[p]referably, coupling 38 and first end 42 of rotor shaft 40 are connected without the use of connecting threads.” Col. 3, lines 52-54.

Applicant therefore submits that independent claims 14 and 21 are not obvious over *Cooper '074*. The remaining rejected claims (i.e., claims 17, 19, 22, and 26) are each dependent upon either claim 14 or 21 and are believed to be allowable for the same reasons set forth above.

G. Mordue '247 or Cooper '074 in View of Howie.

As discussed above in Sections IV.E and IV.F, neither *Mordue '247* nor *Cooper '074* disclose or suggest each and every limitation of independent claims 14 or 21. *Howie* (alone or in combination with *Mordue '247* or *Cooper '074*) likewise does not disclose the limitations of claims 14 and 21.

Howie pertains to “the removal and separation of dross from molten aluminum.” Col. 1, lines 15-16. No portion of *Howie* discloses or suggests using the “decomposer 1” of *Howie* for transferring gas, nor is it clear how it could be modified to do so. The device in *Howie* includes “a rotatable member 51, which includes a cylindrical male thread 63 that engages with a female threaded portion of vertical shaft 66. Thus, the device in *Howie* does not disclose a coupling member with a bore as recited in claims 14 and 21, rather the two shafts (51 and 66) are simply screwed together. In addition to lacking a coupling member, neither shaft 51 or 66 includes a bore as required by claim 21.

Applicant therefore submits that independent claims 14 and 21 are not obvious over *Cooper '074* or *Mordue '247* in view of *Howie*. The remaining rejected claims (i.e., claims 16, 18, 20, 23, and 24) are each dependent upon either claim 14 or 21 and are believed to be allowable for the same reasons set forth above.

CONCLUSION

Reconsideration is respectfully requested. Applicant believes the case is in condition for allowance and respectfully requests withdrawal of the rejections and allowance of the pending claims.

The Examiner is invited to telephone the undersigned at the telephone number listed below if it would in any way advance prosecution of this case.

Respectfully submitted,

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